

chromosomes. In *N. undulata* the two chromosomes in question are always separate; in *N. irrorata* are always united to form a single body; and in *N. insulata* they may be separated in the first spermatocyte division, but are united in the second.

The author traces the origin of the chromosomes from the karyosphere in the three species, and their behavior in the growth stages and maturation divisions.

#### INTERSTITIAL CELLS OF TESTIS AND SECONDARY SEX CHARACTERS

J. des Cilleuls (C. R. Soc. Biol. Paris, 1912, p. 371) finds a strict coincidence in the development of the interstitial cells of the testis and the secondary sexual characteristics of the cock. In chickens the external marks of sex do not begin to appear until about the thirtieth day. By the time the chicks are 45 days old the pullets show a greater development of the tail feathers and the cockerel more color and size of comb. The sex distinctions increase from this point. The author claims that the secondary sex characters in the male bird begin to show with the oncoming of the interstitial cells, and increase as these increase. The author believes that the secretion of the interstitial cells acts as a hormone in stimulating the growth of the characteristic male secondary structures.

#### MICROBIOLOGY IN RELATION TO DOMESTIC ANIMALS

This book, entitled "Principles of Microbiology," with a subtitle "A Treatise on Bacteria, Fungi, and Protozoa Pathogenic for Domesticated Animals," is written primarily for veterinary students beginning the study of microbiology. It consists, in about equal parts, of matter belonging to general bacteriology and to special applications of this to veterinary science. In the very nature of the case this makes the treatment of general bacteriology somewhat less satisfactory than may be had from text-books on this subject, and limits the author somewhat in his treatment of the part of the subject which is peculiar to the book.

The first twelve chapters are given to such subjects as the biology, morphology, classification of bacteria; the apparatus, methods of sterilization, cultivation, staining, and examination of bacteria; the relation of bacteria to disease. In the part relating to